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lem undecided, and considers it, in the absence of geological evidence, a 'waste of time to speculate on it with the help of an up-and-down system for the islands and continents, just as required.' The local distribution of the Celebesian birds is presented in great detail by means of a series of tables, etc. Among the novelties of the work is an attempt to estimate the 'value of the affinities of the peculiar species of Celebes'; in other words, it is recognized that the various genera and species are not units of equal value in computing the relationship of the Celebesian avifauna to that of other neighboring countries. The conclusion reached is that the avifauna of Celebes "has far stronger connections with the Philippines than with any of the other neighboring lands, and that the relation of its birds with the Oriental Region is more than twice as strong as with the Australian Region."

The systematic part includes 393 species, and probably about 150 additional subspecies, all treated with the detail, as regards their bibliography, plumage, distribution, life-history, and affinities, that would be expected in a special faunal work of the magnitude and sumptuous character of the present admirable monograph. Dr. Meyer, the senior author, in addition to his high standing as an ornithologist, has the advantage of knowing personally the region to which the present work relates, he having spent three years (1870-73) in Celebes and neighboring islands, collecting much of the material (about 4000 specimens, now in the Dresden Museum) on which the 'Birds of Celebes' is based. He thus had an opportunity of becoming familiar through actual field work with the geographical and climatic characteristics of the East Indian Archipelago. The numerous colored plates of previously unfigured species are well executed and form a fitting accompaniment to a work of high general excellence, and, moreover, a work which closes an important gap in ornithological literature.

J. A. ALLEN.

A Monograph of Christmas Island. London, British Museum (Nat. History). 1900. Pp. xvi + 337. 8vo. 22 plates, map and cuts. Christmas Island is a small body of land com-

prising about 43 square miles, situated in about latitude 10°, 30' south, nearly 200 miles southwest of the western part of Java, from which it is separated by a depression of the sea floor some 3000 fathoms in depth. Though known to navigators since the middle of the seventeenth century, it has remained uninhabited until very recently, having been explored by Captain Pelham Aldrich R. N., in 1887, and annexed to the British crown in 1888.

It seemed highly desirable that this virgin island should be carefully examined and described by a competent naturalist and geologist before being opened up by Europeans for agricultural and commercial purposes. Accordingly it was arranged with the Trustees of the British Museum that Mr. C. W. Andrews, of the Geological Department, should be granted leave to carry out this exploration, the expenses of which were defrayed by Sir John Murray. Mr. Andrews spent ten months of 1897-98 upon the island and carried out the work with great success. The reports upon the geology and physical conditions of the island in this volume are from his pen, while the various subdivisions of the fauna and flora have been treated by a body of experts to whose descriptions Mr. Andrews has added many notes taken on the spot. The result forms perhaps the most elaborate account of an oceanic island ever published. Sir John Murray, who is interested in the company which has obtained a lease of the island for the purpose of developing its agriculture and deposits of phosphate of lime, intends to watch carefully the effects produced by the immigration of civilized man upon the fauna and flora, and record comparisons in the future for which the present volume will serve as a basis.

The island is of a roughly triangular form with projecting headlands and deep water for the most part close up to the cliffs or the narrow fringing reef which encircles most of the shore. It is in fact the flattish summit of a submarine mountain more than 15,000 feet high which rises some 1200 feet above the sea. The submarine slopes are about two in five, a depth of 6600 feet occurs in less than three miles from the shore and the foot of the mountain within twenty miles. The geological structure in brief,

consists of (1) a central core of older volcanics and Eocene or Oligocene limestones; (2) beds of basalt, volcanic ash and thick masses of Orbitoidal (Miocene) limestones enwrapping the core; (3) masses of talus derived mainly from the Miocene rocks and covered by (4) a thick detrital limestone which is derived from the wear of the reefs which cover the higher portion of the island; (5) a raised reef of much later date which covers the foot of the different slopes composed of 4; and finally (6) the late Pleistocene or recent limestones bordering the sea which cling to the base of any of the older formations which may be exposed.

The history of the island seems to include the deposition of several hundred feet of Eocene limestone on a bank with a volcanic basis; the gradual deposition, with slow depression, of masses of Miocene limestone; then a gradual elevation, with oscillations, during which guano was deposited on low atolls, forming the origin of the present masses of phosphate of lime; and finally the attainment of the present status of an elevated limestone island with interbedded volcanic layers surrounded by a narrow fringing reef of coral.

The prevalent wind on the island is the south-east trade, which blows on the average 300 days in the year, with occasional violent northerly storms. As it is the violent rather than the regular winds which transport exotic organisms to isolated islands, it is natural that a large part of the life on the island should be, as it is, intimately connected with the Malaysian types. Nevertheless, there is a recognizable portion of the fauna which is related to that of Ceylon and another to that of Australia, though the latter country is over 900 miles away.

Of the 319 species of animals recorded, about 45 per cent. are regarded as endemic, though a better knowledge of the fauna of Java may diminish this number. Of the plants about 10 per cent. appear to be peculiar to the island. Of both plants and animals not peculiar many have a widespread distribution.

Of the five mammals, two rats and two bats are peculiar to this island; while the shrew is regarded as a variety of a species inhabiting farther India. Thirty-one species of birds are noted, of which seven land birds are endemic.

The other vertebrates include one snake (*Typhlops*), three skinks and two geckos, of which one skink and one gecko occur elsewhere. The pelagic species are not counted in the fauna, though three of them visit the island.

Of the landshells fourteen species are enumerated, of which six are local, but all belong to groups widely distributed in the Oriental region. Three out of nine butterflies, ten of the sixty-five moths, six of the nine Microlepidoptera, nine out of eleven Hymenoptera, fifty-six of ninety-four Coleoptera, four out of six Hemiptera, two of the five Neuroptera, fourteen of the twenty-two Orthoptera, three of the twelve Arachnids, and two of the four earth-worms are regarded as peculiar to the island.

The illustrations of the work are first-class, and the authorities of the Museum, Mr. Andrews and Sir John Murray, are to be congratulated on the manner in which the description of the island and the census of its organisms have been carried out. The work will doubtless long serve as a model for such investigations and it is to be hoped is the pioneer of many other monographs of a similar character.

WM. H. DALL.

THE HUMANITIES IN HORTICULTURE.

THE second volume of the 'Cyclopedia of American Horticulture,'* of which the first volume was noticed in SCIENCE for June 1st, sustains the high character evidenced in that volume, and is of more than usual interest to the general reader because it happens to include such general topics as greenhouses, herbaceous borders, horticulture, house-plants, labels, landscape-gardening and lawns. These are all so handled as to be interesting and suggestive as well as instructive. Plates 14 (the formal garden at Mt. Vernon), 15 (a modern informal garden), and 16 (a modern cemetery with landscape planting) are especially commendable illustrations.

W. T.

* Bailey, L. H. and Miller, W. *Cyclopedia of American Horticulture*, in four volumes. Vol. 2. E.-M. New York, The Macmillan Company. 1900. \$5.00.